

Abstract Submitted to the  
International Conference on Strongly Correlated Electron Systems  
University of Michigan, Ann Arbor  
August 6-10, 2001

## **Evolution of Magnetic Polarons through the Metal-Semiconductor Transition of Gd-doped EuO \***

H. Rho, C. S. Snow, S. L. Cooper

*Department of Physics and Frederick Seitz Materials Research Laboratory, University of Illinois at  
Urbana-Champaign, Urbana, Illinois 61801*

There has been a great deal of interest recently in understanding the role of magnetic polaron formation in governing complex metal-semiconductor transitions and colossal magnetoresistance-type behavior in a variety of materials. To investigate this relationship, we present Raman scattering studies of magnetic polaron development and the metal-semiconductor transition of Gd-doped EuO single crystals as functions of Gd-concentration, temperature, and magnetic field. Our studies reveal two major properties: (1) the development of a spin-flip Raman scattering response due to magnetic polaron formation when the temperature approaches the ferromagnetic ordering temperature, and (2) a spin-fluctuation-induced electronic Raman scattering response, which shows a maximum response at  $T_c$ . As we will discuss, the temperature-, field-, and doping-dependence of these scattering contributions convey a great deal of information regarding the spin- and charge-dynamics in various phases of this strongly correlated electron system.

---

\*This work is supported by the Department of Energy (DEFG02-96ER45439) and the National Science Foundation (DMR97-00716).